9. Pit Features and Related Mysteries

Soil chemistry and floral analysis helped suggest the purposes and seasonal use of large D-shaped presumed "storage" pits.

Most of the effort in the second Phase II campaign was directed toward two large pit features. A third pit was detected, but not explored. Both pits were stratified, one more obviously than the other.

The pits were labelled, for convenience, the eastern and western pits. Because the eastern pit exhibited the clearest internal organization, we chose to study its stratification in detail.

The pits were found near the unnamed drain that marks the north edge of the peninsula and defines the site boundary. The long-term natural history of this drain has not been explored, but it clearly flowed more robustly than today. Historic maps show it draining a large swamp to the northeast that no longer exists.

The first pit, called the "western pit," had been encountered by units 13, 14, and 20. Units 64 and 65 connected these units and exposed the whole pit (figures 65, 66). Then we opened four units a meter away, numbered 66-69. Unit 67 touched the apparent edge of another pit, farther to the west, which we did not explore in this phase.

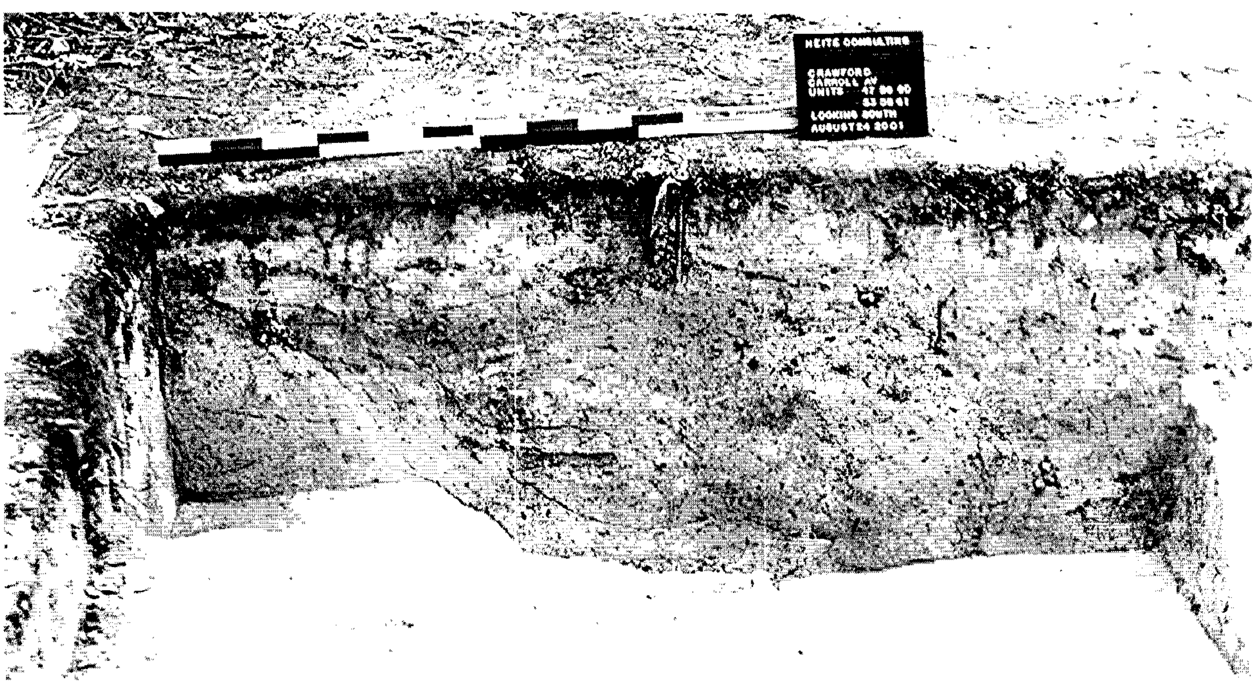

Figure 61: Early in the second Phase II campaign, we encountered a large pit, shown here in profile, that developed into a remarkable detective story.

The western pit was opened in May, when a high water table discouraged additional digging. The eastern pit was dug in late summer, with little problem of water.

Both pits were roughly "D" shaped. They were deep, with rounded bottoms, and apparently had been refilled several times. Although such pits have been found frequently in Delaware, their actual function has never been explored in detail.

The second, "eastern," pit was first encountered in test unit 47, which was located over its eastern edge. At the outset we resolved to analyse the eastern pit's many strata, to try to understand its function.

WHAT KIND OF PIT?

While it is facile to describe any large prehistoric hole as a "storage pit," this category could include pits for the winter storage of food, or it could describe a place to cache tools and heavy personal items. Storage is part of the cycle of life, even today, driven by season and resource availability. Food storage in pits is a well-documented prehistoric pit function, and this became our working hypothesis.

The shape of both pits suggests that they may have been constructed within circular houses. Custer has described these D-shaped pits as associated with semi-subterranean house pits. At the Beech Ridge site, however, no evidence of excavated house pits has been found. Because the surface has not been subject to erosion (as evidenced by the undisturbed "pot drop"), it is unlikely that pit houses were ever present. It is more likely that the pits were placed within surface house structures (Custer 1994: 48-64).

ETHNOGRAPHIC EVIDENCE

In connection with the Puncheon Run site excavation project, also for DelDOT John Bedell of the Louis Berger Group, Inc., has surveyed the literature on the subject of storage pits in the eastern United States (Bedell, in press). Early colonial period accounts document the use of pits for storing food and other items. In some cases, the pits were lined with mats or bark, but in others, baskets or bags of foods (corn, beans or acorns, for example) or raw materials were buried in the loose soil that filled the pits.

It is not clear why pit storage was used, especially when materials were buried in the loose soil filling pits. Colonial observers suggest that the purpose was to conceal the presence or the amount of the stored supplies. However, even the soil-filled pits were easily found and looted by colonists, so this does not seem likely.

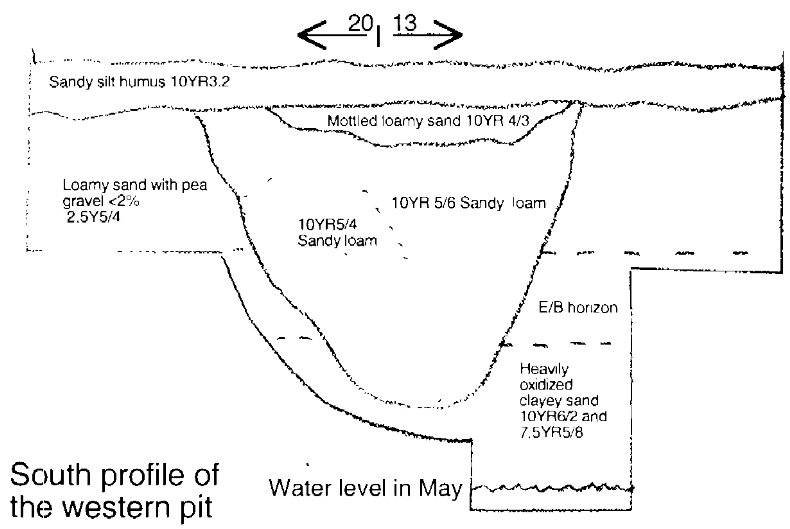

Figure 62: The western pit was first opened in May, when the water table was high and digging was stopped.

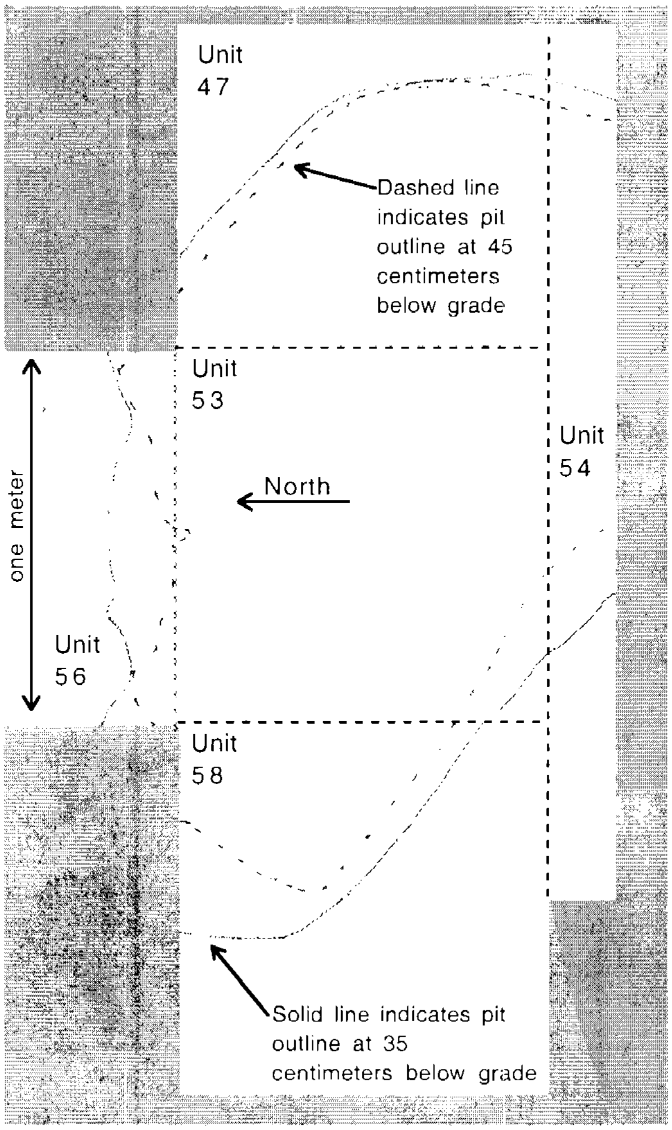

Figure 63: Layout of the eastern pit, which was examined in detail for chemical and floral remains

WHEN WERE THE PITS USED?

Whether these colonial accounts apply to the pits excavated at Beech Ridge depends in part on when the pits were used. The eastern pit yielded sherds of two kinds of Native American pottery that we know were used in the Woodland II Period (1000 CE to 1650 CE), just before the first Europeans arrived here. Townsend ceramics are tempered with shell fragments, and have fabric-impressed or smoothed surfaces. Killens Pond ceramics are similar to Townsend, but have sand and bits of red ochre in the paste, in addition to the crushed shell. These ceramics were found in several layers of soil in the pit, indicating that both the excavation and the use of the pit occurred during the time when these ceramics were in use. We also recovered a number of flakes of Newark Jasper Complex material. A Fox Creek projectile point made from the same material was recovered from a unit nearly 30 meters to the southwest. Because the color and chalcedony banding in the point and in the flakes are similar, it is tempting to suggest that the flakes are from the manufacture of the point and that the pit itself was in use during the period when the projectile point was made. It is more likely, however, that the flakes were from a chipping cluster that was disturbed when the pit was first excavated by the Indian inhabitants.

The western pit, on the other hand, yielded only one ceramic sherd, which could also be placed in the Townsend type, but it was found only in the top deposit of the feature, indicating that the use of the pit may have occurred before this type of ceramic was in use. We recovered a number of flakes of Newark Jasper Complex material in this feature.

PREDICTING PIT LOCATIONS

The pits may have betrayed their presence in the soil chemistry survey. The iron map, Figure ***, shows peaks in the vicinity of the pit features. Iron is more common in the lower natural layers of the soil, which the pits penetrated. Soil from the holes was piled on the ground whenever the pits were opened, inevitably leaving some of the iron-rich soil on the surface, to be detected by our survey. In the pit profile of the eastern pit, we detected a layer, labelled 3, that appeared to be a lens of backdirt that never made it into the hole during one or more of its openings and refillings. The backdirt appears to have been piled on the west side of the hole, suggesting that it was accessed from the eastern side. We should, therefore, logically expect to find a related activity area to the east of the eastern pit.

FOSS OBSERVATIONS

Regarding the eastern pit, Foss observed that chemical results were consistent with field observations:

> The distribution of organic matter and the elements phosphorous, chromium, potassium, calcium, and barium verify the morphologic data that numerous layers or strata are present in pit feature profile, as demonstrated in, Unit 54. In undisturbed soils, the soil organic matter is high in surfaces and decreases rapidly with depth. Unit 54 showed irregular organic matter distribution with depth; higher values in level 12, for example, as compared to levels 5 and 6 nearer the surface shows disturbance of the natural distribution of organic matter in the soil profile. The higher levels of organic matter in specific strata are also areas where the larger quantities of charcoal were present.
>
> Organic matter accumulation in soils is mainly the result of (1) landscape stability with vegetation becoming established and contributing organic material to the soil or (2) organic matter being added in the sediment by water, wind deposition, or by human activity. It appears in this situation, with the charcoal present, that the high organic matter-charcoal strata were periods of stability where vegetation contributed to the soil organic matter but also the presence of human activity had a role in the increase as well.

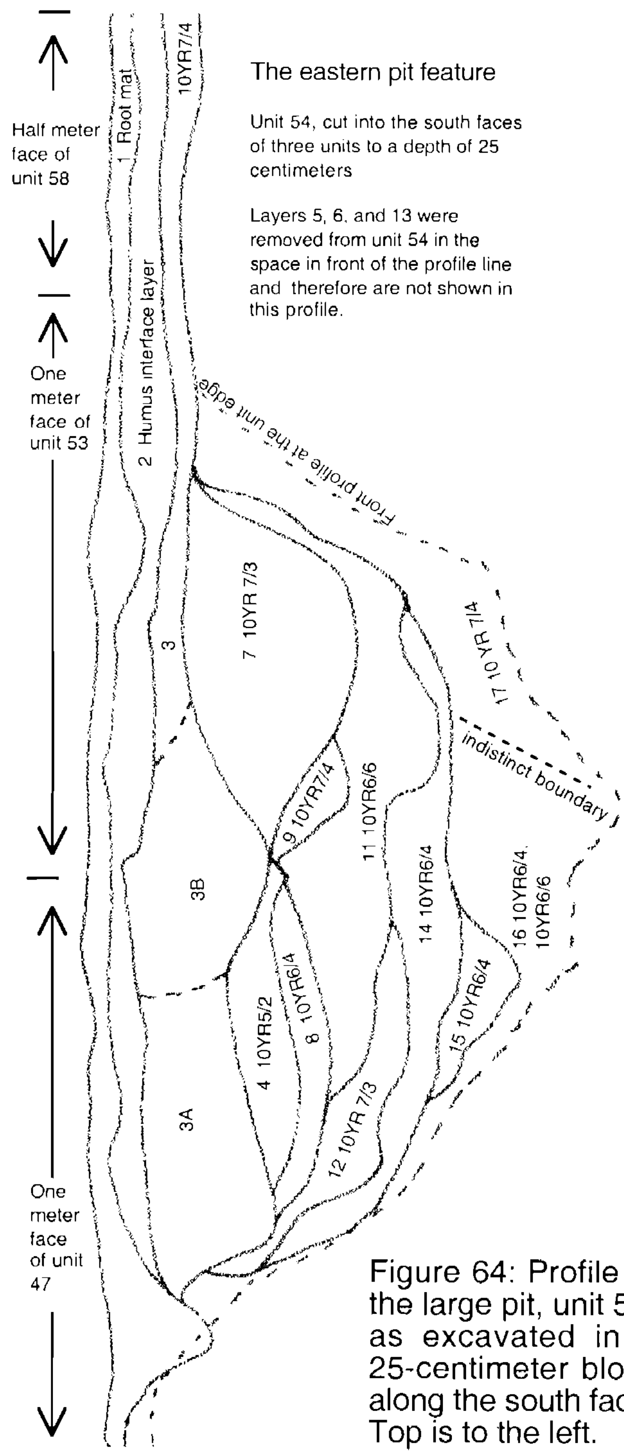

Figure 64: Profile of the large pit, unit 54, as excavated in a 25-centimeter block along the south face. Top is to the left.

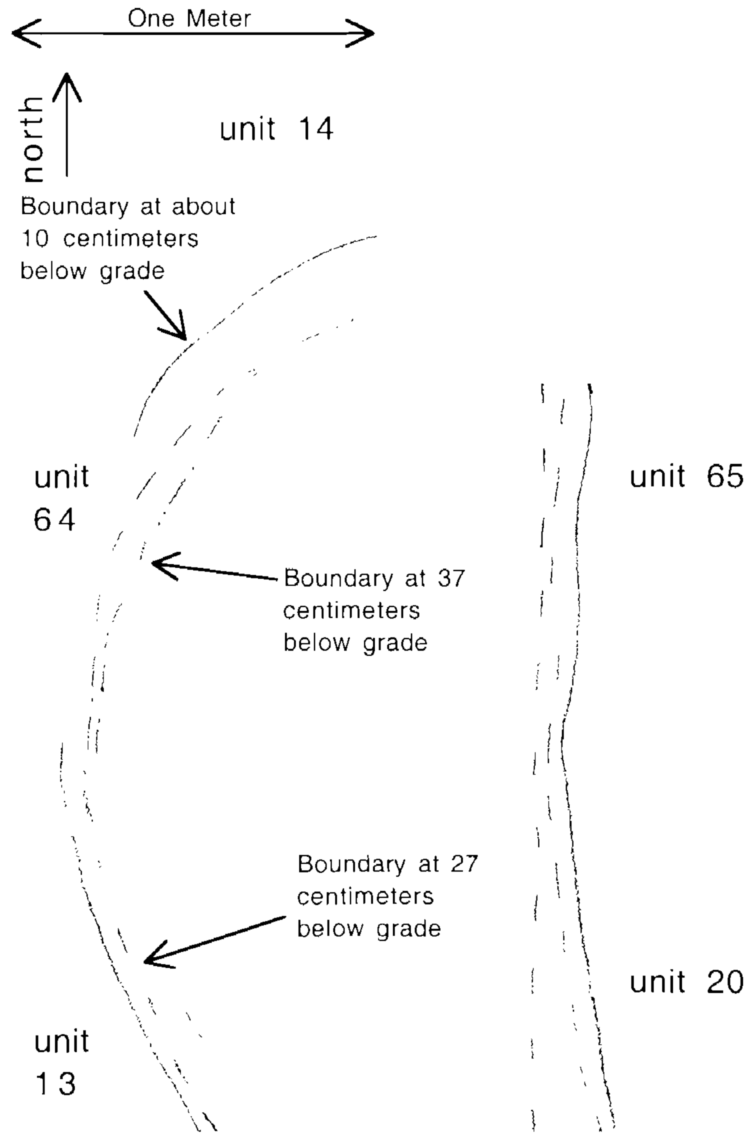

Figure 65: Plan of the western pit clearly demonstrates the "D" plan that appears to characterize a class of prehistoric pit features in Delaware.

The phosphorous content of the various layers shows the discontinuity of P distribution with depth in the pit. The high relative phosphorous content of 18.5 to 34.4 mg/kg in layers 4, 12, and 15 is probably associated with human activity; these same layers had increased amount of charcoal compared to surrounding layers that again suggests human contributions. The content of barium, strontium, potassium, and calcium also indicate discontinuities in the vertical distribution of elements.

25-Centimeter Section

Archæologist and floral analyst Bill Sandy was consulted for advice on the possible plant remains in the layers. As it turned out, there was considerable evidence to be extracted from the pit's seventeen (or more) layers. To get the data that might unravel the pit's history, we opened a unit that consisted of a slice, 25 centimeters front to back, across the south face of our excavation. All the soil in this slice, labelled unit 54, was bagged. One set of samples went to the University of Delaware soil laboratory, while most of the material was sent to William Sandy for floral analysis.

Excavation of the 25-centimeter section proceeded with painstaking precision, under constant review. At each level, the excavators discussed and eventually reached consensus on the limits of the layer. In the course of this process, perceptions of layers tended to change with debate. The experience taught a lesson that even the most "apparent" soil layers are nuanced, so that a difficult stratification should not be left to the ability of only one observer to distinguish.

As we removed the seventeen readily identifiable layers of soil from the 25-centimeter section, we noticed several layers, heavy with charcoal, that seemed to be bottoms or floors. Our field impression was that the hole had been reopened and backfilled at least three times, and probably more.

Flotation Results

Sandy's flotation report revealed considerable differences among contents of the various levels. Using a drum flotation device, Sandy recovered artifacts from all depths, including the bottom layer 17, which appears to be the same material as the subsoil, perhaps redeposited during the initial opening of the pit.

Most prominent in the sample were sclerotia, ball-shaped fungal fruiting bodies that are common on sites in the Northeast. In all layers, samples of this material bore signs of burning, which may have been caused by human activities. Raspberry seeds and nut hulls also showed signs of fire.

The fungal material called sclerotia, sometimes called tuckahoe, has been identified as a "survival" food that could be dried, ground, and mixed into a flour. This fungus "tuckahoe" should not be confused with the better known root-derived food of the same name. The processing method included burying the fungal bodies and building a fire over them. Sandy suggests that this practice might have produced the large numbers of carbonized specimens that commonly are found in prehistoric sites. The subject still awaits additional research, but the huge quantities from the pit suggest that it was a significant material.

Uncharred elderberry, raspberry and grape seeds were recovered from the pit, and Sandy attributed them to probable prehistoric activity, since these relatively large seeds are known to survive long term in the ground. He suggests, however, that some of the other uncharred seeds could have been modern contaminants in the archæological sample, which always is a possibility, however remote.

Based upon the flotation evidence, Sandy suggests that this pit feature was occupied during the late winter or early spring. He cites the low number of of seeds that typically are found in sites occupied during the summer and fall as partial justification for this conclusion.

Sandy suggests that the pits represent a winter or early spring activity. Such uses could include winter storage of scarce foodstuffs for later consumption.

During excavation, we noticed several layers of the pit fill that seemed to be rich in charcoal and likely to represent floors or bottoms of different use stages. We hoped that chemical analysis of the contents of these layers might provide clues to their origins.

Layers 16 and 17, at the bottom, were difficult to distinguish from the surrounding subsoil, except by texture and ever-so-faint color differences. They are shown in the profile without specific boundaries, bottom or side.

But the most interesting deposits in the pit were the grey layers, numbered 4, 12, and 15. Together with layer 11, they contained the largest amounts of charcoal. However, layer 11 was by far the largest sample, so the comparison is weak. We tentatively identified these layers as the surfaces

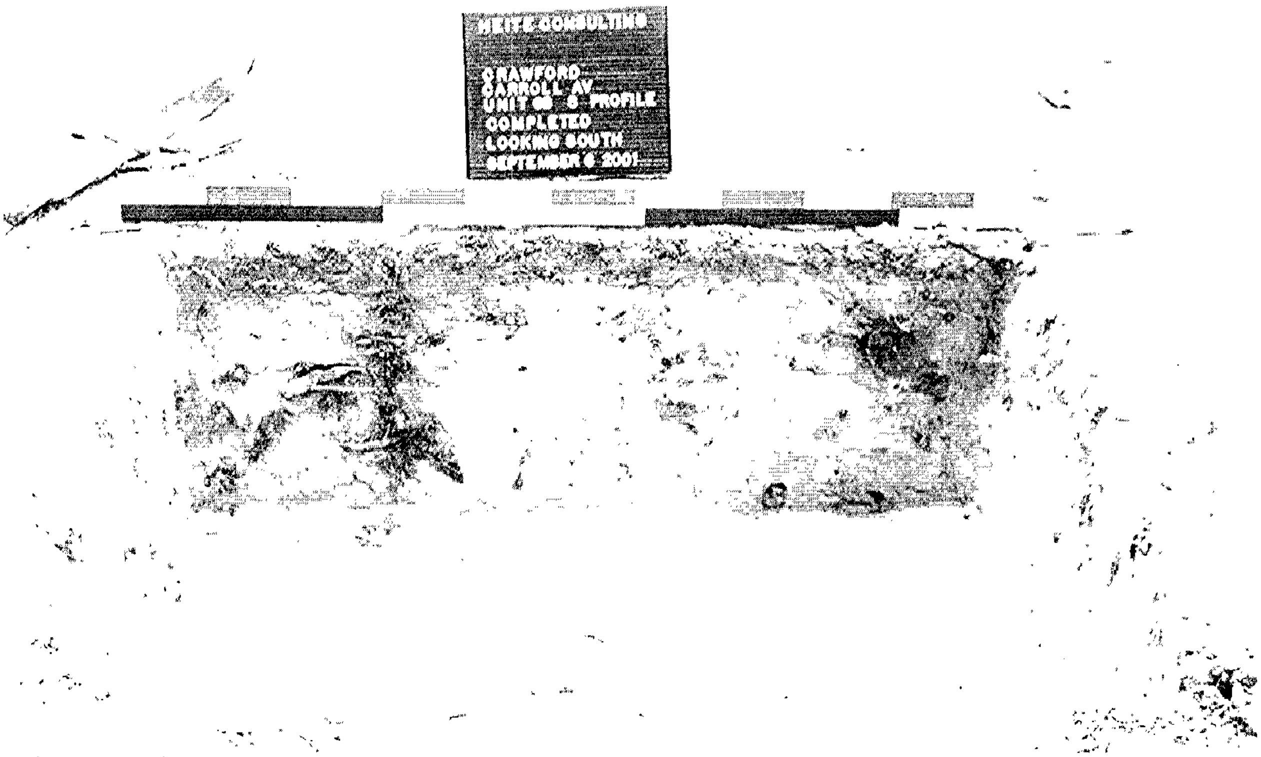

Figure 66: Around the western pit, outlying test units were opened in search of any related features. The results were not conclusive, but a more intensive search for related features is recommended.

that were exposed during periods when the pits were being used. During these periods, the site surface would be rich in charcoal, or ash, resulting from camp activities. When the chemical results were received, it appeared that this conclusion was justified.

Levels 4, 12, and 15 were by far the richest in phosphorous, a marker for human occupation. Phosphorous enrichment has been studied worldwide, and has come to be regarded as the signal for human occupation of a particular part of a site (Farswan and Nautiyal 1997). Soil phosphorous is employed as a tool to define site limits, but some researchers have suggested the ratio of the various chemical elements within a site is indicative of different intrasite functional areas (Schlezinger and Hows 2000).

The possibility of using this chemical marker within a confined feature has not been explored in any systematic way, but the findings from our eastern pit indicate that this might be a useful technique.

Description of levels in the East Pit sample, Unit 54, with identified floral remains

Level	*Munsell*	*Observations*	*Charcoal*	*volume (litres)*	*Floral materials identified by Sandy*
1		Root mat			
2		Recent humic soil			
3	10YR7/4	Hard, compact	0.9g	12	raspberry, sclerotia, nut, poke
3a			0.4g	5	raspberry, sclerotia, tulip tree, acorn, grass
3a/3b			trace	0.25	sclerotia, crabgrass
3b			0.3g	6	raspberry, sclerotia, tulip tree,
4	10YR5/2	Greyish, charcoal	2.4g	10	raspberry, sclerotia, tulip tree, nut, grass
5	10YR6/4	Silt loam	0.1g	4	sclerotia
6	10YR6/4	Silt loam	trace	4	raspberry, bayberry, sclerotia
7	10YR7/3	Compact fill	1.1g	14	raspberry, bayberry, sclerotia, copperleaf, grass, poke
8	10YR6/4	Fill, clay nodules	0.5g	8	raspberry, grape, sclerotia
9	10YR7/4	Mottled fill	trace	7	sclerotia, grass
10	10YR6/4	Reddish fill	0.1g	2	sclerotia
11	10YR6/6	Compact, silty	1.8g	28	violet, sclerotia
12	10YR7/3	Grey, powdery	1.7g	10	raspberry, elderberry, bayberry (?), oxalis, sclerotia
13	10YR6/4	Sandy lens			none recovered
14	10YR6/4	Appears sterile	0.5g	16	sclerotia
15	10YR7/4	Loose grey, powdery	1.5g	8	sclerotia
16	10YR6/4 10YR6/6	Loose fill	0.8g	8	sclerotia
17	10YR7/4	Fill	0.1g	4	sclerotia

RESULTS OF SOIL CHEMICAL ANALYSIS IN THE EASTERN PIT FEATURE

UDSTP Lab#	U/D BAG #	Bag No.	Bag Label	pH	Buffer pH	OM (%) by LOI	M1-P (mg/kg)	M1-K (mg/kg)
11165	839112	12	Unit 54, Layer 3	4.5	7.55	0.4	3.9	18.6
11167	839114	14	Unit 54, Level 4	4.4	7.64	0.8	34.4	9.7
11170	839117	17	Unit 54, Level 5	4.4	7.49	0.2	3.3	14.2
11158	839105	5	Unit 54, Level 6	4.6	7.64	0.7	5.1	12.0
11161	839108	8	Unit 54, Level 7	4.4	7.72	<0.1	10.1	8.3
11157	839104	4	Unit 54, Level 8	4.4	7.66	0.4	3.9	14.0
11156	839103	3	Unit 54, Level 11	4.4	7.63	0.5	4.8	17.7
11154	839101	1	Unit 54, Level 12	4.3	7.55	0.6	27.9	9.2
11166	839113	13	Unit 54, Level 13	4.4	7.70	<0.1	18.9	7.4
11171	839118	18	Unit 54, Level 14	4.3	7.54	0.1	5.2	14.4
11169	839116	16	Unit 54, Level 15	4.3	7.72	0.2	18.5	6.3
11168	839115	15	Unit 54, Level 16	4.4	7.58	<0.1	3.3	11.8
11155	839102	2	Unit 54, Level 17	4.7	7.65	0.2	2.8	12.5

Bag Label	M1-Ca (mg/kg)	M1-Mg (mg/kg)	M1-Mn (mg/kg)	M1-Zn (mg/kg)	M1-Cu (mg/kg)	M1-Fe
Unit 54, Level 3	15.5	6.5	2.65	0.41	0.27	19.95
Unit 54, Level 4	6.7	2.8	3.36	0.54	0.21	27.41
Unit 54, Level 5	7.7	4.5	1.64	0.44	0.27	22.03
Unit 54, Level 6	6.2	3.3	3.70	0.65	0.20	19.72
Unit 54, Level 7	7.2	2.8	1.56	0.31	0.18	19.83
Unit 54, Level 8	8.2	3.7	2.25	0.40	0.19	20.70
Unit 54, Level 11	10.5	4.0	1.96	0.40	0.24	23.71
Unit 54, Level 12	15.3	2.9	2.68	0.60	0.19	25.30
Unit 54, Level 13	7.3	1.8	4.26	0.22	0.11	22.97
Unit 54, Level 14	10.4	3.7	1.69	0.35	0.22	22.24
Unit 54, Level 15	6.8	1.7	2.50	0.64	0.10	19.58
Unit 54, Level 16	7.4	5.8	2.41	0.19	0.19	22.77
Unit 54, Level 17	10.2	4.2	1.80	0.25	0.16	19.90

Bag Label	WB-OM (%)	EPA3051-P (mg/kg)	EPA3051-Ba (mg/kg)	EPA3051-Sr (mg/kg)
Unit 54, Level 3	0.99	176.36	38.48	6.62
Unit 54, Level 4	1.21	328.29	46.40	4.94
Unit 54, Level 5	0.35	163.44	36.84	4.53
Unit 54, Level 6	0.63	164.38	50.45	6.49
Unit 54, Level 7	0.52	156.45	35.64	4.73
Unit 54, Level 8	0.50	119.88	37.42	4.89
Unit 54, Level 11	0.50	154.46	43.13	5.86
Unit 54, Level 12	0.97	318.28	51.66	7.54
Unit 54, Level 13	0.39	186.19	27.77	3.37
Unit 54, Level 14	0.35	170.46	43.10	4.68
Unit 54, Level 15	0.07	208.66	33.95	4.93
Unit 54, Level 16	0.10	160.07	43.68	6.15
Unit 54, Level 17	0.14	128.10	43.85	6.96

DEFINITIONS.
OM by LOI: Organic matter by loss on ignition
WB-OM: Organic matter by Walkley Black (dischromate oxidation)
EPA3051: Refers to the EPA 3051 extraction solution for these elements

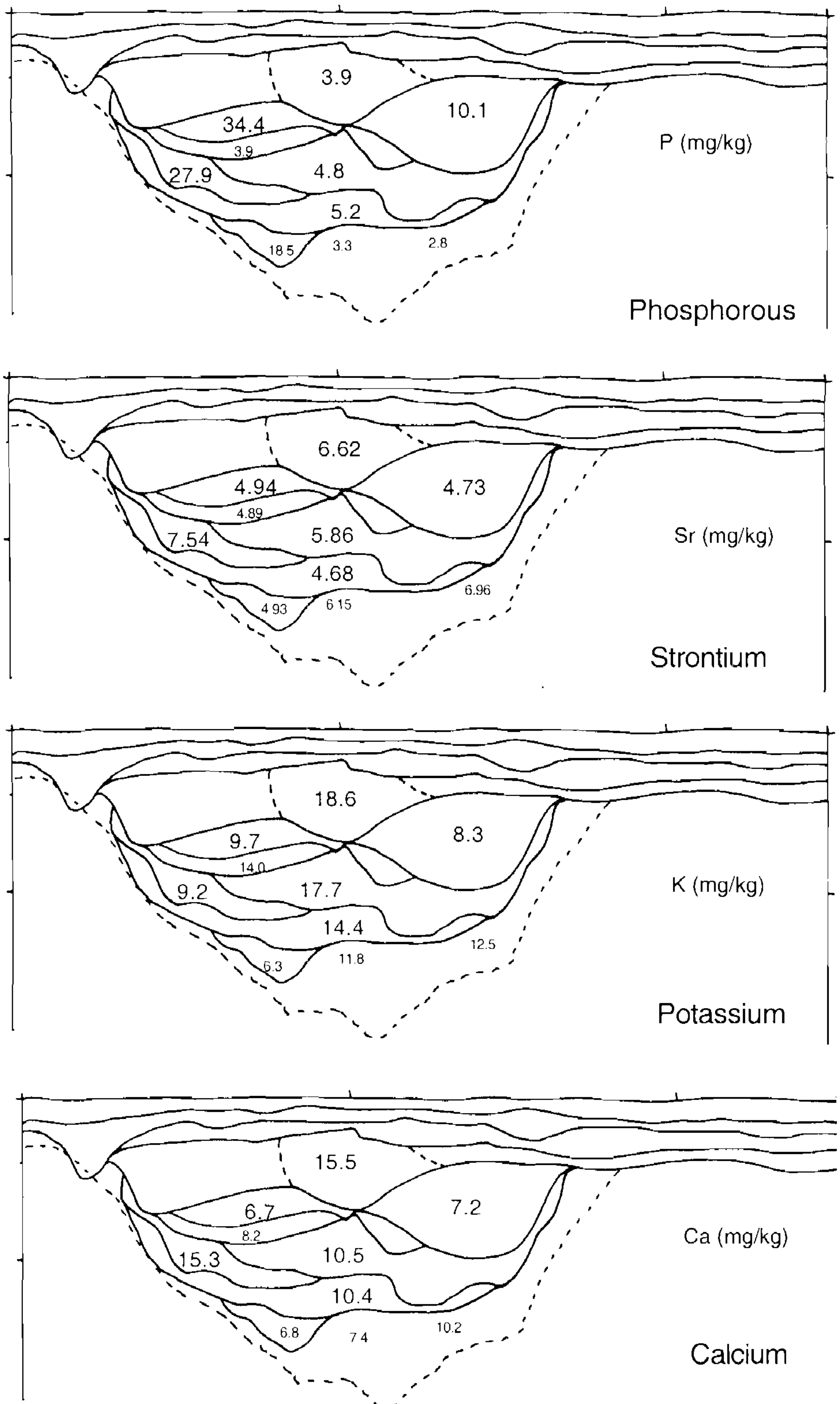

Figure 67: quantities of elements in levels of the east pit.

2. The distribution of phosphorus, calcium, potassium, and iron contents of surface soils is very interesting and may provide information on other disturbed areas of the site. Additional samples, however, are needed in order to provide enough samples to accurately interpret soil chemical changes at the site. The sampling interval should be about five meters depending on the archaeological distribution of artifacts and features.

ADDITIONAL EXCAVATIONS

This clearly is an important site, not only because it has never been plowed, but because it appears to contain a variety of clearly segregated activity areas. We have not exhausted the possibilities for exploring within the right-of-way, especially in the area of the pit features. At least one more pit feature lies unexcavated in that part of the project area.

At the head of the ravine, in the earlier Phase II explorations, we found a concentration of features containing quantities fire-cracked rock, including some particularly large specimens in one feature. This area contained no temporally diagnostic artifacts associated with features, which means that we cannot, at present, determine if they are associated with the nearby pit features. Clearly there is more to be learned about the relationships between the various parts of the site, which may or may not be components of a single processing or procurement activity. Among the research questions that might be addressed through additional excavation are the following:

1. How do the pit features relate to one another? Could they have been in use at the same time, or do they represent different episodes of use?

2. Do the iron concentrations indicated by the soil chemistry predict the locations of pit features?

3. How can the differences in the contents of pits be explained? Do these differences relate to previous activities that were disturbed by the excavation of the pits? Or do they reflect activities related to the use of the pits themselves?

4. Are the pit features associated with house structures? If present, what did these house structures look like?

5. What other activities may have been associated with the pit features?

6. Why is there a "blank spot" in the site?

7. What do the answers to these questions tell us about household and community structure at the Beech Ridge Site?

We recommend a Phase III data recovery campaign that would essentially excavate all the available units west of the fence line in the finally accepted right of way. This would not be a 100% excavation, since many of the prospective units are under the stumps of modern trees and therefore unavailable for excavation. In other areas, such as the bank of the ravine, the slope is too great to suggest the possibility of human habitation.

Taking all these constraints into consideration, we suggest another approximately 75 meter-square excavation units to be opened within the right-of-way, extending up to the Cedar Chase fence line and westward to the edge of disturbance created by construction of the nearby detention basin, wherever that boundary may be found.

The units will be opened according to the protocol employed in